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ABSTRACT

A 67-item Assessment Practices Inventory (API) was administered to 311 inservice teachers. The application of principal components analysis to the data yielded a 6-factor solution that explained 64% of the variance. The Rasch rating scale model was applied to the API to estimate item calibrations. The factor analyzed assessment categories were then ranked in order by difficulty based on mean logits. The distribution of mean logits ranged from -.35 to 0.78. Communicating assessment results was the easiest assessment category. Interpreting standardized test results, conducting classroom statistics, and using assessment results in decision making constituted the most difficult assessment categories. Nonachievement-based grading was more difficult than recommended grading practices, and performance assessment was more difficult than paper-pencil tests. The identification of the hierarchy of classroom assessment categories provided useful information for measurement training and teacher education in assessment. The findings justified ongoing research on grading practices, and supported the call in the assessment community for a shift of instructional emphasis from traditional objective tests to alternative assessments. (Contains 2 figures, 7 tables, and 53 references.) (Author/SLD)

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Teacher Assessment Competency: A Rasch Model Analysis

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Paper Presented at the Annual Meeting of American Educational Research Association
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Abstract

A 67-item Assessment Practices Inventory (API) was administered to 311 inservice teachers. The application of a principal component analysis to the data yielded a six-factor solution that explained 64% of the variance. The Rasch rating scale model was applied to the API to estimate item calibrations. The factor analyzed assessment categories were then ranked in order by difficulty based on mean logits. The distribution of mean logits ranged from -.35 to .78. Communicating assessment results was the easiest assessment category. Interpreting standardized test results, conducting classroom statistics, and using assessment results in decision making constituted the most difficult assessment category. Nonachievement-based grading was more difficult than recommended grading practices. Performance assessment was more difficult than paper-pencil tests.

The identification of the hierarchy of classroom assessment categories provided useful information for measurement training. Teachers should receive more training and exercise in the technical aspect of assessment such as interpreting standardized test results, evaluating teacher-made tests, and developing performance assessment instruments. The findings justified the ongoing research on grading practices. It also supported the call in the assessment community for a shift of instructional emphasis from traditional objective tests to alternative assessments.

Teacher Assessment Competency: A Rasch Model Analysis

Introduction

The 1990s has witnessed marked changes in educational assessment. As part of the educational reform movement cognitive psychologists and educators began to emphasize the importance of higher order thinking skills which are not measured by simple recall items in paper-pencil tests. The need to measure students' ability to apply knowledge in real life situations, to cooperate with others, and to do hands-on activities gave rise to a new emphasis on alternative assessment methods. In addition, the fact that 99% of the assessment activities in the classroom are conducted by teachers called a shift of attention from large scale standardized testing to classroom assessments (Stiggins, 1991b). With these changes came the time for teachers to move into the center stage of classroom assessment (Stiggins, 1992a).

Research indicates that teachers spend up to 50% of their classroom time in assessment related activities (Stiggins, 1991a). This underscores the need for a high level assessment competency among classroom teachers. A few large-scale studies have been conducted in recent years to investigate teacher competence of educational assessment. These studies have invariably come to the conclusion that teachers' preparation for testing and measurement is inadequate (Jett & Schafer, 1992; Newman & Stallings, 1982; Marso & Pigge, 1989; Plake, 1993; Plake, Impara, & Fager, 1993; Wise, Lukin, & Roos, 1991). Among the solutions proposed in these studies were strengthening measurement training for preservice and inservice teachers and requiring an assessment component in teacher certification.

What constitutes classroom assessments? Is there a hierarchy of difficulty to classroom assessment techniques? What implications does it have on measurement training? The present study attempts to address these questions.

Related Literature

Classroom Assessment Skills

What assessment skills should be included in a testing and measurement course to ensure that preservice and inservice teachers are adequately trained? The answer to this

question will delineate the content domain of classroom assessment skills. Drawn from measurement textbooks and published literature, Schafer (1991) specified eight content areas in which teachers need to develop assessment skills:

1. Basic concepts and terminology of assessment. Teachers should understand assessment concepts and correctly use terms such as objective tests, alternative assessments, formative versus summative assessment, criterion-referenced versus norm-referenced testing and grading, validity, and reliability (Airasian, 1994; Carey, 1994; Schafer, 1991).

2. Uses of assessment. Assessment can be used for planning and evaluating instruction, diagnosing problem areas, monitoring progress, grouping students, assigning grades, developing curriculum, and evaluating school improvement (Burry-Stock, 1995; Stiggins, 1987).

3. Assessment planning and development. To plan assessment, the teacher needs to consider students' ability level, specify assessment targets, and choose appropriate assessment methods (Airasian, 1994; Carey, 1994; Stiggins, 1992b). Writing objectives and designing test specifications are two important devices at assessment planning stage to ensure validity and reliability of assessment (Burry-Stock, 1995; Zhang & Iran-Nejad, 1993). Three major assessment methods are paper-pencil tests, performance measures, and informal assessment (Stiggins, 1992b). The first two methods are considered formal and the last one informal (Airasian, 1994).

4. Interpretation of assessments. To properly interpret standardized test results, teachers need to have a good understanding of the meaning and limitations of standard scores such as percentile rank, grade equivalent score, normal curve equivalent, and stanine. They should understand the concept of standard error of measurement and be able to use this concept in explaining a percentile band-of-error. In addition, teachers should know how to judge the adequacy of test norms and use norms to evaluate an individual's performance (Airasian, 1994; Carey, 1994; Schafer, 1991).

5. Description of assessment results. This content area involves the application of basic statistical analysis to classroom assessment data.

6. Evaluation and improvement of assessments. The teacher should be able to use

assessment data to analyze the quality of a test (validity and reliability) and test items (item analysis) (Carey, 1994; Gregory, 1996).

7. Feedback and grading. When assigning grades, teachers need to make three decisions: the grading model to be used (criterion-referenced versus norm-referenced), performance components to be included in grades (achievement-related versus nonachievement-related), and the weight each component should receive (Airasian, 1994). Criterion-referenced grades indicate mastery level of teaching objectives whereas norm-referenced grades suggest an individual's relative standing in a class. To produce valid grades, teachers should only include achievement-related components in the calculation of final grades. Assessment components that reflect effort, ability, attitude, and motivation should not be included in subject matter grades because they are hard to define and measure (Stiggins, Frisbie, & Griswold, 1989). Assessment components that provide more information about students' academic achievement and learning (e.g., final exam) should receive more weights (Airasian, 1994; Carey, 1994). The methods that can be used to integrate different assessment components to determine the final grades include percentage method, weighted method, and maximum point method (Carey, 1994). When called upon, teachers should explain to students, parents, and other educational personnel the meaning, implication, and limitation of the grading system they use to determine grades.

8. Ethics of assessment. Teachers should guard against overuse and misuse of assessment results. Students' right to fair testing and confidentiality should be protected (Plake, 1993).

These assessment skills summarized the expectations of the assessment community for classroom teachers. In 1990, the American Federation of Teachers (AFT), the National Council on Measurement in Education (NCME), and the National Education Association (NEA) issued the seven Standards for Teacher Competence in Educational Assessment of Students. The seven Standards incorporated various assessment skills addressed in measurement textbooks and assessment literature. According to the seven Standards, teachers should be skilled in

1. choosing assessment methods,
2. developing assessment methods,

3. administering, scoring, and interpreting assessment results,
4. using assessment results in decision making,
5. grading,
6. communicating assessment results, and
7. ethics in assessment.

The seven Standards were intended to guide teacher evaluation and measurement training.

Research revealed that teachers are not well prepared to meet classroom assessment demands as specified in the seven Standards (Stiggins, 1991a) due to inadequate measurement training (Goslin, 1967; Hills, 1991; Jett & Schafer, 1992; O'Sullivan & Chalnick, 1991; Roeder, 1972; Wolmut, 1988). Problems can be found in different aspects of classroom assessment.

Stiggins (1992a) conducted qualitative research with a group of teachers teaching math, science, speaking, and writing in second, fifth, eighth, and eleventh grades. Seventy-eight percent of the teachers reported using performance assessment in their classroom. However, one third of these teachers did not define levels of performance or plan scoring procedures in advance, nor did they inform students of performance evaluation criteria. About 50% of the teachers did not record their scoring during assessment. These practices were not in line with recommended performance assessment methods.

Teachers were not well trained to use standardized tests in their classrooms (Marso and Pigge, 1988). Many teachers did not know that standardized tests and teacher-made tests should differ in terms of test administration (Vanleirsburg and Johns, 1991). Fifty-five percent of the teachers in Hall and Kleine's (1992) study reported engaging in inappropriate practices of teaching test items, increasing time limits, giving hints, and changing students' answers. The pressure for teachers to raise standardized test scores through means other than instructional improvement was also widely reported by the teachers in another study by Nolen, Haladyna and Haas (1992). In addition, most teachers had trouble understanding and interpreting standard scores such as percentile rank and grade equivalent score (Hills, 1991). Impara, Divine, Bruce, Liverman, and Gay (1991) reported, based on their experimental study, that most teachers were weak in interpreting a percentile band profile even with the help of interpretive information.

Grading criteria used by teachers were often arbitrary and mysteries (Wiggins, 1988). Stiggins, Frisbie, and Griswold (1989) discovered that 80% of teachers in 15 high schools in their study felt that effort, attitude, and motivation should be considered in grading; 50% of them indeed incorporated ability into grades. Fifty percent of the teachers studied did not distinguish between formative and summative data and thus did not use weights to reflect the relative importance of assessment components. All teachers used subjective nonachievement factors to make decisions about borderline cases. Griswold suggested that teachers incorporated social-cognitive learning and attribution theories into their grading belief system and practice when they graded on nonachievement factors of efforts and attitude. It was not clear, however, how teachers operationally define and assess these intrinsic dispositions.

Rasch Rating Scale Model

Rasch model is a family of item response theory (IRT) models that assume that item difficulty is the only item characteristic affecting an individual's performance on a test item (Rasch, 1960). Like all IRT models, Rasch model has the advantage of offering a sample-free item parameter estimate, a test-free ability parameter estimate, and a standard error of measurement for each individual item (Hambleton, Swaminathan, & Roger, 1991). Rasch rating scale model is appropriate for measurement instruments with fixed response format (Wright & Masters, 1982). When fixed response format is used, the relative difficulties of the response categories should be invariant. Thus, the formula for the Rasch rating scale model according to Wright and Masters is

$$\pi_{nix} = \frac{\exp \sum_{j=0}^{x} [\beta_n - (\delta_i + \tau_j)]}{\sum_{k=0}^{m} \exp \sum_{j=0}^{k} [\beta_n - (\delta_i + \tau_j)]} \qquad x = 0, 1, \ldots, m$$

where

$\tau_0 = 0$ so that $\exp \sum_{j=0}^{0} [\beta_n - (\delta_i + \tau_j)] = 1$

β_n = ability estimate for examinee n

δ_i = scale value estimate for item i

τ_j = threshold estimate for category j, this is done for $m + 1$ categories

exp = raising the irrational number e to the natural log (1982, p. 49).

When a rating scale is analyzed using this model, it is possible to obtain an ability estimate for each examinee, a difficulty estimate for each item, and estimates of response "thresholds" $\tau_1, \tau_2, \ldots, \tau_m$ for m+1 categories (Wright & Masters, 1982).

Rasch model has been used in quite a few validation studies. In Harvey-Beavis' study (1994), a Spelling Developmental Continuum was designed according to the published judgements of experts. The instrument consisted of phases called indicators describing behaviors associated with literacy acquisition for children. To establish the extent of accuracy of the Spelling Continuum, teachers were asked to provide empirical evidence by recording whether their students exhibited the spelling behaviors specified in the instrument. The data were analyzed under the Rasch model. The greater the number of students displaying a behavior described by an indicator, the easier that indicator was estimated to be. Ideally, the early phase of spelling development should have indicators with low scale values (easy tasks) and the last phase should have indicators with high scale values (difficulty tasks).

Kenyon (1995) used a two-facet Rasch rating scale model to validate a self-assessment instrument of foreign language speaking ability. The instrument was designed in accordance with the Speaking Proficiency Guidelines of the American Council on Teaching of Foreign Languages (ACTFL). Rasch model was used to first determine difficulty parameter for each speaking task (item) and then compare the scaling of speaking tasks presented by the self-assessment with their a priori hierarchy ordering specified by the guidelines of the ACTFL. The study attempted to determine whether foreign language students perceived the difficulty of performing speaking tasks in a manner consistent with their hierarchy ordering as specified in the guidelines.

In Zhu and Kurz's (1995) study, Rasch Partial Credit modeling was used to confirm the theory of developmental sequence in motor development. Rasch Partial Credit model was applied to the calibration of a motor development instrument. Zhu and Kurz concluded

that the features of the theory of developmental sequence such as hierarchical change, hierarchical integration, and intransitive were well demonstrated through the Rasch modeling.

Even though the three studies differed in content area, they all used the scaling of the items on an instrument as an empirical evidence to validate the developmental sequence suggested by the instrument.

The present study was based on the theoretical framework of classroom assessment in the literature and the seven Standards. Different from most other research endeavors in classroom assessment, the study attempted to determine the hierarchy of teacher assessment competency with Rasch model. The results of the study would provide valuable information for measurement training.

Methodology

Instrumentation

The instrument used in the study was the Assessment Practices Inventory (API) designed by Zhang and Burry-Stock (1994). After three pilot studies and numerous revisions, the current version of the API had 67 items each of which described a classroom assessment practice. A 5-point scale ranging from "NOT AT ALL SKILLED" to "HIGHLY SKILLED" was used for the subjects to self-report their perceived skill level in carrying out classroom assessment activities as specified by the 67 items. The statistical analysis of the data from 311 inservice teachers yielded a Cronbach alpha coefficient of .97, indicating the instrument had a high measure of reliability. All item-to-total correlations were above .37 with the highest one being .69. The standard error of measurement was 7.7.

The content validity of the API was built into the construction process by developing the items according to the seven Standards for Teacher Competence in Educational Assessment of Students and assessment literature. The construct validity of the API was supported by strong item-to-total correlations (81% of the items were above .50) (Gregory, 1996) and a moderate distribution of item calibrations along a continuum of -.89 to 1.31 (Wright & Stone, 1979).

Sample

The sample was made up of 311 inservice teachers who came mainly from two local school districts in Alabama. The numbers of elementary, middle school/junior high, and high

schools participating in the study were 6, 4, and 6, respectively. A vocational school was also included in the data collection. This was done to ensure a balanced representation of teachers from different grade levels. The subjects were primarily white (89%) and female (77.4%). The percentages of elementary, junior high/middle school, and high school teachers were 34, 23, and 30, respectively. The remaining 13% were for comprehensive and other types of schools. Forty percent of these teachers obtained a bachelor's degree, another 56% had a Master's degree. About 28% of the inservice teachers had had one measurement course, 45% of them had taken 2-3 measurement courses. The average number of years of teaching was 10.9.

Data Collection

Data were collected in March, 1995. The instrument, together with a cover letter and computer scanable answer sheet, was distributed to the teachers by their school principal at a faculty meeting. Since directions were clearly provided in written form, participants responded to the instrument on their own. Those who voluntarily responded to the instrument returned the completed answer sheets to the school secretary. The return rate was approximately 30%.

Data Analysis

Principal component analysis was used to check IRT assumptions of unidimensionality and local independence. The Rasch rating scale model computer program BIGSTEPS (Linacre & Wright, 1994) was used to estimate item calibrations for the 67 items of the API. Based on principal component analysis, the 67 items were grouped into assessment categories each of which was represented by a factor. The difficulty of each assessment category was then determined by calculating the mean calibration of the items belonging to that category. The analysis would reveal how inservice teachers perceived the relative difficulty of assessment categories.

Results

IRT Assumption Check

A principal component analysis of the data indicated that the first principal component accounted for 31.83% of the variance. This number met Recase's (1979) criterion that 20 percent of the variance should be explained by the first principal component. Thus, it was

concluded that unidimensionality assumption was satisfied. Since the instrument was unidimensional, it followed that the assumption of local independence would hold (Lord & Novick, 1968).

Principal Component Analysis

The application of principal component analysis to the data with principal axis method of extraction and a varimax orthogonal rotation yielded a six-factor solution. The six-factor solution best represented the initial classification of assessment categories while meeting the criterion of eigenvalues greater than one (Kaiser, 1960). The six factors accounted for 53.14% of the variance. The six factors were:

1. Develop and administer paper-pencil tests, choose tests for classroom use,
2. Interpret standardized test results/conduct classroom statistics, use assessment results in decision making,
3. Communicate test results, ethics in assessment,
4. Develop and use performance assessment, informal assessment,
5. grading, and
6. Nonachievement based grading.

Insert Table 1 Here

Table 1 shows rank ordered factor loadings of individual items for the six factor solution. For each factor, only high loadings (greater than .33) selected by the computer program are presented. The final communality estimates for each item, the sum of squared factor loadings for each factor, and the percent of variance explained by each factor are also presented.

Rasch Rating Scale Model Analysis

Data-to-Model Fit. Data-to-model fit was not as satisfactory as expected. The analysis of 311 persons indicated that about 10% of the persons had infit and outfit mean-square values greater than 1.6. This occurred when some high-ability persons unexpectedly failed some of the easier items or some low-ability persons passed some of the harder items (Wright & Stone, 1979). About 8% of the items had infit and outfit mean-square values

greater than 1.4. A "misfit" item often indicates that the item is poorly defined. Since the study was mainly interested in obtaining sample-free item calibration, it was decided to remove misfiting persons in order to improve the precision of item estimates. After 41% of the persons and 13% of items were removed, all the items except five (31, 32, 34, 35, and 49) had infit and outfit mean-square values equal to or less than 1.27 and 1.28, respectively. The five items whose infit mean-square values fell within the range of 1 to 1.53 and whose outfit mean-square values fell within the range of 1 to 1.68 were of some concern to the researcher. However, since the five items were important to research questions, they were kept for data analysis.

The deletion of misfiting persons and items was an interactive process. What was noticed in this process was that misfiting was a relative phenomenon. This was particularly true for person analysis. After the top 10% of the misfiting persons were delected and the analysis was reconducted on the reduced sample, some other persons were found to have increased infit and outfit statistics, almost as high as those of the items that had been deleted. This explained why some persons still had high infit and outfit mean-square values after numerous deletions. Nevertheless, the fit statistic analysis and subsequent person and item deletion resulted in improved person mean infit and outfit statistics (infit ZSTD was reduced from 3.0 to 1.9, outfit ZSTD was reduced from 2.8 to 1.8) and item mean infit and outfit statistics (infit ZSTD was reduced from 2.7 to 1.9, outfit ZSTD was reduced from 2.9 to 1.9). The information about person mean statistics, corrected person reliability measure, item mean statistics, and corrected item reliability measure are presented in Tables 2 and 3, respectively. The fit statistics for average step measures also dropped from the original range of 1.40 to .93 to the current range of 1.24 to .95, indicating the improvement in measurement precision. This information is presented in Table 4.

Insert Tables 2, 3, and 4 Here

Estimates of Item Difficulty and Person ability. After misfiting persons and items were removed, item calibrations ranged from -1.23 to 1.23. The most difficult item was "calculating test statistics" and the easiest item was "administering standardized tests".

Person Ability estimates ranged from -2.56 to 6.88. The distributions of persons and items are presented in Figure 1. The average step measures for steps 1 through 5 ranged from -.89 to 2.64 (Table 4). The category (steps) probability curves are presented in Figure 2.

Insert Figures 1 and 2 Here

Item calibrations, item infit and outfit mean-square values, and item labels are presented in Table 5. The number at the beginning of each item label indicates the factor on which the item is heavily loaded. Person measures are presented in Table 6.

Insert Tables 5 and 6 Here

Ranking Assessment Categories by Rasch Model Analysis

Based on the principal component analysis, the 67 items of the API were classified into six assessment categories each of which was represented by a factor. Based on the Rasch model analysis, the item calibrations of the 58 items (nine items were deleted due to misfit) were estimated. To get a better idea of the difficulty of each assessment category, the mean logit of the items belonging to a category was calculated. The six categories were then ranked in order by their mean logit values. The factor analyzed assessment categories and their mean logits are presented in Table 7.

Insert Table 7 Here

Of the six assessment categories, interpreting standardized test results/conducting classroom statistics and using assessment results in decision making were perceived to be the hardest category by inservice teachers and communicating assessment results was considered to be the easiest. The result confirmed previous research findings that teachers were weak in interpreting test results even with the help of interpretative information (Hills, 1991; Impara, Divine, Bruce, Liverman, & Gay, 1991). Notice the category at the top of the hierarchy of difficulty also involved technical issues such as conducting item analysis and calculating

central tendency and variability. The current finding in a way provided an explanation for Marso and Pigge's (1989) report that 44% of the teachers in their study never or rarely conducted item analysis and 60% of them never or rarely estimated test reliability for teacher-made tests.

Nonachievement based grading practices had the second highest mean logit, higher than regular grading category. This finding was not surprising to the assessment community. Grading practice has long been the focus of classroom assessment research. Much research has been generated to address the difference between the recommended practice of grading on achievement-related factors and the classroom reality of incorporating nonachievement-related factors in grading. The current finding justified the ongoing research endeavor to reduce the difference. Teachers found it hard to grade on nonachievement factors of effort, ability, and behavior even though they incorporated these factors in grading (Stiggins, Frisbie, & Griswold, 1989; Zhang, 1995). A possible reason for this was that teachers realized that nonachievement factors were hard to define thus their judgement may be subjective (Griswold, 1993).

Another interesting but not surprising finding was that performance assessment was perceived to be harder than paper-pencil tests. The finding challenged the traditional measurement training program in which paper-pencil tests played a dominant role. If teachers considered performance assessment to be more difficult than objective tests, they should receive more training in alternative assessment methods. The current finding lent support to Stiggins' (1991b) comment that the new educational assessment era in the 1990s called for a shift of instructional emphasis in measurement training from traditional objective tests to alternative assessments.

Discussion and Conclusion

The present study was built on the theoretical framework of classroom assessment literature. Rasch rating scale modeling and principal component analytic technique were used to first obtain sample-free item calibrations and then determine the hierarchy of classroom assessment categories. The ranking of assessment categories provided us an opportunity to reexamine the design of measurement training program and pointed out directions for improvement.

Assessment practices requiring technical training and expertise remained to be the most difficult category. Interpreting standardized test results, determining the validity of standardized tests for classroom use, conducting item analysis and test evaluation for teacher-made tests constituted this category. Obviously teachers need a lot more training and exercise than what is normally provided in interpreting test results, evaluating tests, and using assessment results in decision making. Efforts have been made recently to address this problem. Based on the results from a national survey of teacher assessment competency (Plake, 1993), the NCME (1994) has embarked on producing and testing measurement training materials *Communicating and Interpreting Assessment Results*. Hopefully, the release of the final product will provide adequate resource materials in this category for measurement training.

Teachers reported using performance assessment in their classroom (Stiggins, 1992b); yet the present study indicated that they considered themselves less skilled in using performance assessment than using paper-pencil tests. The finding lent support to the call for a shift of instructional emphasis from traditional objective tests to alternative assessments (Stiggins, 1991b). Recent measurement textbooks have incorporated alternative assessment methods with examples (e.g., Airasian, 1994; Carey, 1994). More exploration into the area is needed both theoretically and technically. Recently published research on the development of performance assessment (e.g., Baron, 1991; Brandt, 1992; Dunbar, Koretz, & Hoover, 1991; Meyer, 1992; Quellmalz, 1991; Shavelson, Baxter, & Pine, 1991; Stiggins, 1987) has made a significant contribution to the assessment literature. Measurement training programs should utilize these resources to strengthen the alternative assessment component in teacher assessment education.

The study was one of the few research endeavors that sought to investigate and facilitate the implementation of the seven Standards issued by the AFT, NCME, and NEA (1990). One inference that could be made based on the present study was that the seven Standards did not carry equal weights. The seven Standards suggested a sequence in application from choosing assessment methods (Standard 1) or developing assessment methods (Standard 2) to administering and scoring tests, interpreting test results (Standard 3), using assessment results in decision making (Standard 4), grading (Standard 5), communicating test results (Standard

6), and meeting ethical standards (Standard 7). However, no assumption should be made that the seven Standards are of equal importance . Since performance assessment and paper-pencil tests, both related to Standard 2, emerged as two separate assessment categories in the present study, it was concluded that Standard 2 carried more weight than other standards. Standards 1 and 7, on the other hand, did not emerge as separate categories. Instead, they were incorporated into other assessment categories. The message here seemed to suggest that, while using the seven Standards as the general guidelines, measurement training programs should adjust the instructional emphasis on the seven Standards and thus accommodate the real needs of classroom teachers.

Since the self-report inventory was used only with 311 inservice teachers mainly from two school districts, the present research findings should be interpreted with caution. A larger and more representative sample is desired to replicate the study. The design of the study can also be improved by using objective evaluation methods (e.g., evaluating teachers' assessment behaviors and products) instead of self-report technique.

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Table 1

A Principal Component Analysis of the API: A Six-Factor Solution With a Varimax Rotation N=311 .

	FACTOR1	FACTOR2	FACTOR3	FACTOR4	FACTOR5	FACTOR6	COMMUNALITY ESTIMATE
ITEM15	.74						.63
ITEM14	.74						.64
ITEM12	.72						.67
ITEM13	.71						.57
ITEM16	.69						.64
ITEM4	.65						.59
ITEM17	.63						.58
ITEM5	.55						.41
ITEM2	.55						.44
ITEM32	.53						.53
ITEM18	.50						.59
ITEM49	.50						.57
ITEM3	.49						.37
ITEM19	.47						.52
ITEM52	.43						.45
ITEM64	.37						.35
ITEM35		.73					.57
ITEM36		.71					.60
ITEM34		.70					.56
ITEM33		.68					.63
ITEM37		.67					.56
ITEM38		.65					.61
ITEM46		.61					.54
ITEM43		.54					.49
ITEM40		.51					.57
ITEM39		.50					.61
ITEM47		.49					.52
ITEM25		.49					.39
ITEM9		.48					.38
ITEM8		.47					.35
ITEM67			.64				.50
ITEM66			.61				.46
ITEM65			.55				.48
ITEM41			.54				.54
ITEM62			.54				.50
ITEM61			.50				.46
ITEM63			.50				.46
ITEM60			.47				.50
ITEM42			.46				.52
ITEM11			.40				.46
ITEM1			.40				.41
ITEM59			.38				.42

Table 1 Continued

A Principal Component Analysis of the API: A Six-Factor Solution With a Varimax Rotation N=311

	FACTOR1	FACTOR2	FACTOR3	FACTOR4	FACTOR5	FACTOR6	COMMUNALITY ESTIMATE
ITEM28				.74			.70
ITEM29				.74			.68
ITEM27				.67			.62
ITEM30				.64			.61
ITEM24				.61			.49
ITEM26				.59			.62
ITEM31				.58			.48
ITEM7				.56			.49
ITEM6				.50			.45
ITEM21				.49			.61
ITEM22				.46			.51
ITEM10				.44			.56
ITEM45				.59			.57
ITEM44				.56			.57
ITEM48					.49		.57
ITEM58					.45		.37
ITEM51					.44		.54
ITEM23					.44		.49
ITEM20					.40		.48
ITEM54						.77	.67
ITEM56						.77	.70
ITEM55						.74	.65
ITEM57						.69	.55
ITEM53						.65	.61
ITEM50						.33	.35
SUM OF SQUARED FACTOR LOADINGS	8.09	6.76	6.26	6.10	4.24	4.16	35.61
% OF VARIANCE EXPLAINED	12.07	10.09	9.34	9.10	6.33	6.21	53.15

Table 2

SUMMARY OF 182 MEASURED (NON-EXTREME) PERSONS

	RAW SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	144.8	57.4	.74	.19	1.03	.1	1.01	.1
S.D.	35.5	3.6	1.27	.08	.36	1.9	.36	1.8

MODEL RMSE .20 ADJ.SD 1.25 SEPARATION 6.18 PERSON RELIABILITY .97
REAL RMSE .22 ADJ.SD 1.25 SEPARATION 5.77 PERSON RELIABILITY .97
S.E. OF PERSON MEAN .09
WITH 1 EXTREME PERSONS = 183 PERSONS
MODEL RMSE .24 ADJ.SD 1.25 SEPARATION 5.14 PERSON RELIABILITY .96
REAL RMSE .25 ADJ.SD 1.24 SEPARATION 4.90 PERSON RELIABILITY .96

Table 3

SUMMARY OF 58 MEASURED (NON-EXTREME) ITEMS

	RAW SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	634.4	180.1	.00	.10	1.01	.1	1.01	.1
S.D.	64.8	1.6	.59	.01	.20	1.9	.21	1.9

MODEL RMSE .10 ADJ.SD .58 SEPARATION 5.90 ITEM RELIABILITY .97
REAL RMSE .10 ADJ.SD .58 SEPARATION 5.63 ITEM RELIABILITY .97
S.E. OF ITEM MEAN .08

Table 4

SUMMARY OF MEASURED STEPS

CATEGORY LABEL	STEP VALUE	OBSERVED COUNT	AVGE MEASURE	OUTFIT MNSQ	OB/EX FIT	STEP MEASURE	STEP ERROR	EXPECTED SCORE MEASURES STEP-.5	AT STEP	STEP+.5	THURSTONE THRESHOLD	CATEG RESIDUL
1	1	415	-.89	3.88	1.24	NONE			(-3.22)	-2.41		-1.1
2	2	1461	-.37	1.72	1.04	-1.95	.06	-2.41	-1.48	-.84	-2.16	-1.1
3	3	2406	.15	.72	1.00	-.60	.03	-.84	-.25	.42	-.76	.9
4	4	4592	.90	.51	.92	-.11	.02	.42	1.40	2.82	.21	2.5
5	5	1574	2.64	1.47	.95	2.66	.03	2.82	(3.81)		2.72	-1.2
						modal			mean		median	

OB/EX FIT IS "OBSERVED MNSQ / EXPECTED MNSQ"

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Table 5

ITEMS STATISTICS: MEASURE ORDER

ENTRY NUM	RAW SCORE	COUNT	MEASURE	ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PTBIS	ITEMS
35	486	178	1.23	.09	1.51	5.3	1.68	6.7	.42	2test statistics
36	516	180	1.03	.09	1.25	2.6	1.23	2.3	.58	2item analysis
46	510	178	1.03	.09	.85	-1.6	.86	-1.4	.67	2NR grading
31	521	180	.98	.09	1.40	4.2	1.47	4.6	.53	4portfolios
8	531	182	.95	.09	1.20	2.1	1.27	2.6	.49	2validity of SAT
9	531	182	.95	.09	1.09	.9	1.11	1.1	.58	2UTS planning
37	531	180	.91	.09	1.08	.8	1.08	.8	.60	2item revision
34	539	179	.82	.09	1.38	3.9	1.46	4.5	.52	2pband interpret
47	545	178	.75	.09	1.04	.5	1.06	.6	.61	2CR grading
38	555	180	.72	.09	1.00	.0	1.06	.6	.61	2SAT diagnose
19	564	182	.69	.09	1.18	1.9	1.21	2.1	.63	1essay scoring
24	568	181	.64	.09	.97	-.3	1.04	.4	.59	4PA scoring
22	579	181	.54	.09	.90	-1.1	.91	-.9	.61	4PA criteria define
43	569	178	.54	.09	.78	-2.3	.75	-2.4	.69	2decision school
33	584	180	.48	.09	1.27	2.7	1.28	2.6	.57	2SAT interpret
18	591	182	.47	.09	.84	-1.6	.82	-1.7	.63	1cognitive levels
40	604	180	.32	.09	.77	-2.3	.75	-2.3	.69	2decision curriculum
17	612	182	.30	.09	.94	-.5	1.04	.4	.64	1essay items
55	601	178	.29	.09	1.24	2.3	1.26	2.3	.53	6grading on improvement
23	627	180	.11	.10	.90	-.9	.90	-.9	.61	5PA criteria communicate
48	627	178	.05	.10	.95	-.5	.93	-.6	.69	5borderline grading
53	628	178	.04	.10	.98	-.2	.96	-.4	.56	6grading on ability
63	630	178	.02	.10	.95	-.4	.94	-.5	.61	3communicate to educators
20	640	181	.02	.10	.95	-.5	.99	-.1	.64	5test sampling
64	627	177	.02	.10	.95	-.5	1.06	.5	.57	1ethics in test preparation
5	645	181	-.04	.10	1.17	1.6	1.23	1.9	.55	1unannounce quizz
39	644	180	-.04	.10	.91	-.8	.92	-.7	.62	2decision teaching
42	642	179	-.07	.10	.73	-2.5	.70	-2.4	.70	3decision classroom
56	642	178	-.09	.10	1.12	1.1	1.11	.9	.51	6grading on efforts
62	643	178	-.10	.10	.93	-.6	.95	-.4	.66	3communicate to parents
2	663	182	-.16	.10	1.15	1.3	1.17	1.3	.53	1select test items
41	653	179	-.17	.10	.84	-1.5	.83	-1.4	.62	3decision ind.
1	665	182	-.18	.10	.91	-.8	.94	-.5	.53	3choose assessments
29	662	181	-.19	.10	.84	-1.5	.84	-1.3	.64	4group hands-on
45	658	179	-.22	.10	1.02	.2	.97	-.2	.61	5grading philosophy
27	667	181	-.24	.10	.84	-1.5	.83	-1.4	.65	4group participation
30	664	180	-.25	.10	.75	-2.2	.73	-2.1	.69	4ind. presentation
21	670	181	-.26	.10	.63	-3.4	.63	-2.9	.72	4PA validity
15	674	182	-.27	.10	.96	-.3	.98	-.1	.58	1T/F items
44	665	179	-.29	.10	1.06	.5	.99	.0	.63	5systematic grading
6	681	182	-.34	.10	1.23	2.0	1.23	1.8	.49	4questioning
13	685	182	-.39	.10	1.09	.8	1.08	.6	.59	1MC items
51	674	179	-.39	.10	.98	-.2	.94	-.4	.66	5weighted grading
3	686	182	-.40	.10	1.25	2.2	1.24	1.9	.49	1revise tests
60	673	178	-.41	.10	.88	-1.1	.84	-1.2	.67	3written feedback
10	688	182	-.42	.10	.82	-1.6	.81	-1.5	.62	4objective planning
14	690	182	-.44	.10	.95	-.4	.90	-.7	.63	1matching items
16	692	182	-.46	.10	.77	-2.0	.72	-2.1	.66	1short answer items
28	689	181	-.47	.10	.90	-.9	.86	-1.1	.64	4ind. hands-on
61	686	178	-.55	.11	.81	-1.6	.73	-2.0	.67	3communicate to students
26	700	181	-.59	.11	.76	-2.0	.74	-1.9	.66	4ind. participation
7	704	182	-.59	.11	.98	-.2	1.02	.2	.48	4observation
11	706	182	-.62	.11	1.01	.1	1.01	.0	.57	3match instruction
49	705	177	-.84	.11	1.40	3.3	1.25	1.7	.59	1grading criteria communicate
12	733	182	-.94	.11	.78	-1.8	.75	-1.7	.61	1PP tests
59	725	178	-1.05	.12	1.05	.4	.96	-.3	.54	3oral feedback
4	753	182	-1.22	.12	1.12	1.0	1.07	.4	.55	1announce quizz
32	750	181	-1.23	.12	1.53	4.2	1.41	2.6	.52	1SAT administer
MEAN	634.	180.	.00	.10	1.01	.1	1.01	.1		
S.D.	65.	2.	.59	.01	.20	1.9	.21	1.9		

Table 6

PERSON STATISTICS: MEASURE ORDER

ENTRY NUM	RAW SCORE	COUNT	MEASURE	ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PTBIS	PER
55	231	58	6.88	1.01	.94	-.1	.35	-.6	.29	55
167	229	58	5.74	.59	.98	.0	.70	-.5	.21	167
52	221	58	4.26	.34	1.24	1.0	.91	-.3	.46	52
69	219	58	4.05	.32	.91	-.4	.70	-1.2	.60	69
50	218	58	3.95	.31	.92	-.4	.75	-1.0	.56	50
9	214	58	3.61	.28	.81	-1.0	.81	-.9	.42	9
305	214	58	3.61	.28	.97	-.2	.91	-.5	.41	305
96	213	58	3.53	.28	1.48	2.6	1.22	1.1	.59	96
98	213	58	3.53	.28	1.31	1.7	1.24	1.2	.27	98
211	213	58	3.53	.28	1.24	1.3	1.16	.8	.38	211
21	211	58	3.38	.27	1.35	2.0	1.33	1.8	.35	21
263	210	58	3.31	.26	1.04	.2	.99	.0	.40	263
300	206	57	3.29	.26	1.08	.4	1.09	.5	-.06	300
129	208	58	3.18	.26	1.05	.3	.95	-.3	.64	129
213	205	58	2.99	.25	1.16	.9	1.08	.5	.56	213
210	201	58	2.75	.24	1.47	2.6	1.36	2.1	.42	210
258	133	39	2.61	.29	.95	-.2	.92	-.4	.14	258
90	4	1	2.47	1.82	MAXIMUM ESTIMATED MEASURE					90
285	193	58	2.32	.23	.72	-1.5	.73	-1.4	.52	285
48	186	58	1.98	.22	1.60	2.9	1.42	2.2	.61	48
80	186	58	1.98	.22	1.55	2.7	1.49	2.5	.24	80
175	186	58	1.98	.22	1.17	.8	1.20	1.0	.38	175
148	184	58	1.88	.21	1.14	.7	1.15	.7	.22	148
200	184	58	1.88	.21	1.55	2.6	1.47	2.3	.40	200
33	183	58	1.84	.21	1.00	.0	1.01	.1	.63	33
298	183	58	1.84	.21	.82	-.8	.82	-.9	.58	298
119	180	58	1.71	.21	2.01	4.7	1.92	4.5	.43	119
216	179	58	1.66	.21	1.66	3.1	1.75	3.6	.43	216
227	179	58	1.66	.21	1.71	3.3	1.64	3.1	.37	227
27	178	58	1.62	.21	.86	-.7	.83	-.8	.27	27
94	178	58	1.62	.21	1.32	1.5	1.17	.8	.62	94
293	178	58	1.62	.21	1.24	1.1	1.24	1.1	.50	293
34	175	58	1.50	.20	1.33	1.5	1.32	1.5	-.01	34
53	174	58	1.46	.20	.15	-3.9	.14	-4.0	.00	53
92	174	58	1.46	.20	.15	-3.9	.14	-4.0	.00	92
128	174	58	1.46	.20	.15	-3.9	.14	-4.0	.00	128
303	174	58	1.46	.20	1.74	3.4	1.73	3.5	.54	303
262	163	54	1.43	.21	1.46	2.0	1.47	2.1	.21	262
114	172	58	1.38	.20	2.31	6.1	2.03	4.8	.56	114
204	172	58	1.38	.20	1.17	.8	1.12	.5	.67	204
35	171	58	1.34	.20	.51	-2.3	.50	-2.3	-.01	35
59	171	58	1.34	.20	.83	-.8	.81	-.9	.26	59
163	171	58	1.34	.20	.51	-2.3	.55	-2.1	.44	163
153	170	58	1.30	.19	1.28	1.3	1.32	1.5	.51	153
235	170	58	1.30	.19	.41	-2.7	.40	-2.8	.09	235
304	170	58	1.30	.19	1.20	.9	1.11	.5	.53	304
165	168	58	1.23	.19	.53	-2.2	.56	-2.0	.21	165
77	166	58	1.16	.19	.73	-1.3	.78	-1.0	.34	77
173	166	58	1.16	.19	.52	-2.2	.51	-2.3	.27	173
244	166	58	1.16	.19	1.35	1.7	1.29	1.4	.46	244
306	166	58	1.16	.19	.75	-1.2	.69	-1.5	.59	306
176	165	58	1.12	.19	.85	-.7	.82	-.8	.34	176
299	165	58	1.12	.19	1.75	3.5	1.55	2.6	.66	299
58	164	58	1.09	.19	.84	-.8	.93	-.3	.37	58
122	164	58	1.09	.19	.62	-1.8	.61	-1.8	.20	122
264	161	57	1.09	.19	1.37	1.8	1.39	1.8	.45	264
158	161	58	.98	.18	1.25	1.2	1.27	1.3	.39	158
191	160	58	.95	.18	.49	-2.5	.51	-2.3	.52	191
66	159	58	.92	.18	1.23	1.1	1.19	.9	.66	66
88	159	58	.92	.18	.79	-1.0	.78	-1.0	.57	88

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Table 6 Continued

PERSON STATISTICS: MEASURE ORDER

ENTRY NUM	RAW SCORE	COUNT	MEASURE	ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PTBIS	PER
233	159	58	.92	.18	.91	-.4	.88	-.6	.27	233
100	158	58	.89	.18	1.02	.1	1.15	.7	-.02	100
107	158	58	.89	.18	.86	-.7	.89	-.5	.55	107
146	158	58	.89	.18	1.41	2.0	1.36	1.7	.63	146
212	158	58	.89	.18	.99	-.1	.98	-.1	.32	212
242	158	58	.89	.18	1.04	.2	1.04	.2	.05	242
67	157	58	.85	.18	1.15	.7	1.26	1.2	.47	67
294	157	58	.85	.18	1.23	1.2	1.14	.7	.19	294
78	156	58	.82	.18	1.89	4.4	1.70	3.4	.49	78
162	153	57	.80	.18	.62	-1.9	.52	-2.3	.59	162
16	155	58	.79	.18	1.22	1.1	1.18	.9	.34	16
132	155	58	.79	.18	.74	-1.3	.78	-1.0	.21	132
209	153	58	.73	.17	.63	-1.8	.61	-1.9	.56	209
144	152	58	.70	.17	.69	-1.6	.69	-1.5	.41	144
99	151	58	.67	.17	.78	-1.1	.67	-1.6	.50	99
184	151	58	.67	.17	1.12	.6	1.11	.5	.52	184
199	151	58	.67	.17	.79	-1.1	.73	-1.3	.44	199
292	151	58	.67	.17	.77	-1.2	.88	-.6	.25	292
267	140	54	.64	.18	.89	-.5	.84	-.7	.60	267
130	150	58	.64	.17	1.20	1.0	1.11	.6	.29	130
288	150	58	.64	.17	1.23	1.2	1.24	1.2	.10	288
238	149	58	.61	.17	1.00	.0	.88	-.6	.42	238
311	149	58	.61	.17	1.70	3.6	1.71	3.5	.40	311
194	148	58	.58	.17	1.03	.2	.95	-.3	.34	194
203	148	58	.58	.17	1.16	.9	1.16	.8	.39	203
268	148	58	.58	.17	1.54	2.8	1.74	3.7	.00	268
51	146	58	.53	.17	1.24	1.3	1.29	1.5	.54	51
149	146	58	.53	.17	1.11	.6	1.12	.6	.74	149
168	146	58	.53	.17	1.12	.6	1.30	1.5	-.18	168
218	146	58	.53	.17	.79	-1.1	.72	-1.4	.59	218
219	146	58	.53	.17	1.23	1.2	1.33	1.7	.51	219
237	146	58	.53	.17	1.29	1.6	1.40	2.0	.39	237
157	145	58	.50	.17	.39	-3.2	.37	-3.2	.60	157
208	144	58	.47	.17	1.43	2.3	1.41	2.1	.66	208
103	143	58	.44	.17	1.01	.0	1.03	.2	.35	103
249	143	58	.44	.17	.43	-3.0	.43	-2.9	.54	249
287	143	58	.44	.17	1.07	.4	1.03	.2	.39	287
295	143	58	.44	.17	.70	-1.6	.74	-1.4	.62	295
74	142	58	.42	.16	1.83	4.5	1.75	3.9	.62	74
301	142	58	.42	.16	.95	-.3	.86	-.7	.49	301
309	142	58	.42	.16	.96	-.2	.87	-.7	.48	309
40	141	58	.39	.16	1.20	1.1	1.09	.5	.45	40
126	141	58	.39	.16	.71	-1.6	.78	-1.2	.43	126
137	141	58	.39	.16	1.02	.1	1.01	.0	.44	137
140	141	58	.39	.16	.72	-1.5	.77	-1.2	.08	140
229	140	58	.36	.16	1.21	1.1	1.19	1.0	.14	229
159	138	58	.31	.16	1.70	3.8	1.73	3.9	.42	159
281	138	58	.31	.16	1.26	1.4	1.15	.8	.52	281
289	138	58	.31	.16	.93	-.4	.92	-.4	.50	289
260	54	22	.29	.27	1.03	.1	.94	-.2	.51	260
117	137	58	.28	.16	.92	-.5	.84	-.9	.59	117
188	137	58	.28	.16	.75	-1.4	.78	-1.2	.51	188
234	137	58	.28	.16	1.68	3.8	1.75	4.0	.23	234
255	137	58	.28	.16	1.27	1.5	1.21	1.1	.38	255
214	136	58	.26	.16	1.04	.2	1.02	.1	.44	214
226	136	58	.26	.16	.92	-.4	.87	-.7	.51	226
280	136	58	.26	.16	1.03	.2	1.01	.1	.45	280
64	133	57	.25	.16	1.12	.7	1.10	.5	.70	64
177	135	58	.23	.16	.60	-2.2	.64	-1.9	.52	177

Table 6 Continued

PERSON STATISTICS: MEASURE ORDER

ENTRY NUM	RAW SCORE	COUNT	MEASURE	ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PTBIS	PER
257	135	58	.23	.16	.62	-2.1	.64	-1.9	.61	257
57	133	58	.18	.16	.36	-3.6	.37	-3.4	.55	57
85	133	58	.18	.16	.89	-.6	.84	-.8	.19	85
195	133	58	.18	.16	1.02	.1	1.00	.0	.38	195
250	132	58	.16	.16	1.03	.2	.99	.0	.43	250
245	131	58	.13	.16	1.08	.5	1.08	.5	.47	245
63	130	58	.11	.16	1.07	.4	1.05	.3	.44	63
95	129	58	.08	.16	1.66	3.8	1.66	3.7	.66	95
196	129	58	.08	.16	.82	-1.0	.84	-.9	.47	196
147	128	58	.06	.16	1.12	.7	1.18	1.0	.40	147
46	126	58	.01	.15	1.26	1.5	1.26	1.5	.02	46
151	126	58	.01	.15	.93	-.4	.88	-.7	.70	151
134	125	58	-.01	.15	1.29	1.7	1.28	1.6	.31	134
302	125	58	-.01	.15	1.19	1.1	1.15	.9	.39	302
236	124	58	-.04	.15	.84	-.9	.84	-.9	.34	236
6	123	58	-.06	.15	.42	-3.4	.41	-3.4	.66	6
274	123	58	-.06	.15	1.15	.9	1.11	.6	.29	274
108	122	58	-.08	.15	1.01	.1	.98	-.1	.49	108
154	122	58	-.08	.15	1.29	1.7	1.31	1.8	.35	154
164	122	58	-.08	.15	1.04	.3	1.03	.2	.33	164
150	121	58	-.11	.15	.68	-1.9	.69	-1.8	.21	150
116	118	58	-.18	.15	.48	-3.1	.50	-2.9	.48	116
70	117	58	-.20	.15	.27	-4.4	.30	-4.2	.20	70
121	117	58	-.20	.15	.93	-.4	.92	-.5	.56	121
276	117	58	-.20	.15	.95	-.3	1.01	.1	.21	276
1	116	58	-.22	.15	1.14	.9	1.23	1.4	.37	1
26	116	58	-.22	.15	.73	-1.6	.74	-1.5	.41	26
82	116	58	-.22	.15	.28	-4.3	.31	-4.1	.00	82
101	116	58	-.22	.15	1.30	1.8	1.32	1.9	.23	101
166	116	58	-.22	.15	.45	-3.3	.48	-3.1	-.07	166
278	116	58	-.22	.15	.51	-3.0	.53	-2.8	.08	278
297	115	58	-.24	.15	1.12	.7	1.10	.6	.35	297
2	114	58	-.27	.15	.61	-2.4	.60	-2.4	.39	2
202	113	58	-.29	.15	.67	-2.0	.69	-1.9	.69	202
246	113	58	-.29	.15	1.04	.3	1.06	.4	.61	246
30	112	58	-.31	.15	.47	-3.3	.47	-3.2	.61	30
84	112	58	-.31	.15	.71	-1.8	.73	-1.6	.64	84
170	111	58	-.33	.15	.60	-2.5	.60	-2.4	.66	170
279	111	58	-.33	.15	1.57	3.5	1.57	3.5	.46	279
215	110	58	-.36	.15	1.39	2.4	1.46	2.8	.09	215
221	110	58	-.36	.15	.73	-1.7	.70	-1.8	.60	221
222	110	58	-.36	.15	1.04	.3	1.08	.5	.51	222
275	102	54	-.39	.15	1.20	1.2	1.23	1.4	.15	275
65	108	58	-.40	.15	1.04	.3	1.08	.5	.72	65
93	108	58	-.40	.15	.94	-.4	.95	-.3	.64	93
284	104	56	-.42	.15	1.04	.2	1.03	.2	.47	284
259	61	32	-.46	.20	.87	-.6	.90	-.4	-.02	259
39	104	58	-.49	.15	.64	-2.2	.63	-2.3	.48	39
155	104	58	-.49	.15	1.17	1.1	1.20	1.2	.28	155
17	103	58	-.51	.15	.93	-.4	.92	-.5	.42	17
156	100	58	-.58	.15	1.54	3.4	1.56	3.4	.43	156
13	99	58	-.60	.15	1.18	1.2	1.19	1.2	.45	13
43	94	58	-.71	.15	1.14	.9	1.18	1.1	.24	43
261	94	58	-.71	.15	.96	-.3	.93	-.4	.35	261
282	73	49	-.84	.16	1.31	1.8	1.30	1.7	.59	282
109	87	58	-.87	.15	.98	-.1	1.08	.5	-.51	109
135	87	58	-.87	.15	1.05	.3	1.13	.8	.08	135
239	86	58	-.89	.15	1.29	1.8	1.28	1.7	.42	239

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Table 6 Continued

PERSON STATISTICS: MEASURE ORDER

ENTRY NUM	RAW SCORE	COUNT	MEASURE	ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PTBIS	PER
181	84	58	-.93	.15	1.43	2.7	1.45	2.8	.66	181
277	84	58	-.93	.15	.89	-.7	.89	-.7	.22	277
189	83	58	-.96	.15	1.25	1.6	1.23	1.4	.63	189
231	81	58	-1.00	.15	.69	-1.9	.67	-2.0	.57	231
37	64	58	-1.40	.16	.87	-.7	.87	-.7	.24	37
138	28	58	-2.56	.21	1.06	.3	1.06	.3	.27	138
MEAN	145.	57.	.74	.19	1.03	.1	1.01	.1		
S.D.	36.	4.	1.27	.08	.36	1.9	.36	1.8		

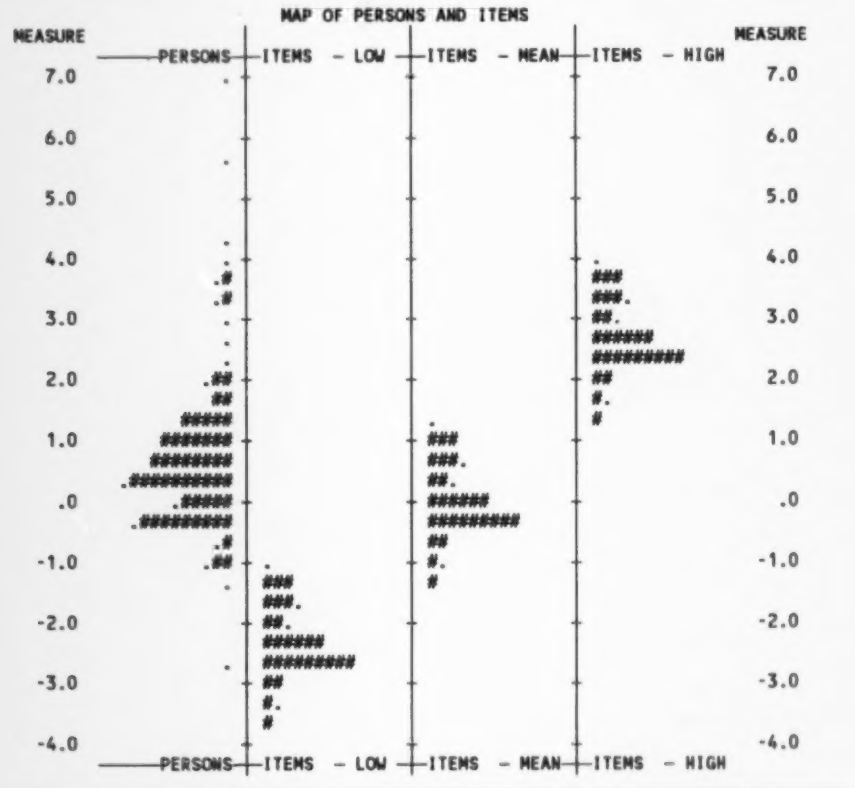
Table 7

Rank Order Factor Analyzed Assessment Categories by Difficulty Based on Rasch Model Analysis N=311

Rank	Assessment Categories	Mean Logit
1	Interpret standardized test results/conduct classroom statistics, use assessment results in decision making	.75
2	Nonachievement based grading	.08
3	Develop and use performance assessment, informal observation	-.10
4	Grading	-.12
5	Develop and use paper-pencil tests, choose assessment methods	-.33
6	Communicate assessment results	-.35

Figure 1

DISTRIBUTIONS OF PERSON AND ITEM MEASURES BY RASCH ANALYSIS
311 PERSONS 67 ITEMS ANALYZED: 182 PERSONS 58 ITEMS 5 CATEGORIES



EACH '#' IN THE PERSON COLUMN IS 3 PERSONS; EACH '.' IS 1 TO 2 PERSONS
EACH '#' IN THE ITEM COLUMN IS 2 ITEMS ; EACH '.' IS 1 ITEM

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Figure 2

CATEGORY PROBABILITIES: MODES - Step measures at intersections